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(54) Benævnelse: **Elektromekanisk drev til en indretning med flydeevne**

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Electro-mechanical drive for a floatable device

The invention relates to an electro-mechanical drive for a floatable device, which is employable in sport fishing, wherein the drive is releasably connected to the device via a mount, which is located underneath the waterline.

From the DE 84 01 738 U1 a drive apparatus became known, in which the option is given to drive motor-less watercrafts by means of a propeller, which is immersed into the water.

With the DE 10 2013 2018 735 A1 a watercraft became known, in particular a sports watercraft, which is formed as a surfboard and includes a drive at the underside thereof, wherein the drive includes a propeller, which is disposed in a depression at the underside of the surfboard, which depression extends along the longitudinal axis of the surfboard and forms an open channel towards the underside, in which channel the drive is disposed such that the surface swept by the propeller partially extends through the depression.

The US 20 030167991 A1 discloses an assembly kit, which results in the conversion of a traditional surfboard into a motorized surfboard, in order to assist the surfer when paddling out from the shore. A small motor is provided, which may be attached to the surfboard, and is manipulated by a remote control. The motor is directly installed into a

rudder or into a fin, which may be attached to the surfboard without any structural modification. The remote control is wireless and is manipulated by the hand or the wrist of the surfer. Such a motorized surfboard propels the surfer at a low speed.

An electrically operated surfboard according to US 2013/0157526 A1 is to provide the beginner with a surfboard, which may be driven with one or more drive systems, which respectively consist of an electrical motor, a drive shaft and a rotor. The rotor may be a propeller, which is mounted into a side fin of the board or is an impeller in a water jet.

With the EP 2 824 027 A1 a boat drive unit became known, which includes a self-contained liquid cooling system, the liquid thereof being contained in a closed interior space. The interior space is formed by means of a cylindrical exterior surface of a cylindrical motor housing section of the drive unit for exchanging thermal energy with an electro-motor, which is disposed therein. The interior space of the closed liquid cooling system is partially delimited by a shell structure of the drive unit in such a manner that the liquid in the interior space is in direct contact with the shell structure. Thus, the exchange of thermal energy with the water of the environment is possible.

A passively stable hydrofoil boat with a floating device is illustrated according to the US 2015/0104985 A1. The

watercraft consists of a strut with an upper end, which is connected to a flotation installation and with a lower end, which is connected to a hydrofoil boat. The hydrofoil boat reduces the force expenditure for travelling at higher speed. The watercraft has a drive system, which is connected to the hydrofoil boat. Both the longitudinal and the directional control of the watercraft is realized via a weight shift such as not to require mobile surfaces. The flotation device, the strut and the hydrofoil boat may be firmly connected to each other and may be detachable.

The US 2014 024 5943 A1 represents an inflatable fishing boat with a removable paddle bottom, wherein the boat also contains an adjustable removable rudder frame. The boat may be manoeuvred and driven by rowing, a thrust rod or by a small motor.

Nowadays, there are many diverse devices for sport fishing, which partially also consist of inflatable boats, in order to move to certain places on a body of water, so as to practise there the sport of fishing. However, especially for sport fishing, it is not necessary to purchase large inflatable boats. There is an alternative, which allows for fishing directly on the water surface. One such alternative offers for example a so-called belly boat. A belly boat is substantially smaller than a normal inflatable boat and allows the fisherman to freely move on the surface of the water and to simultaneously practise sport fishing in a two-handed manner. The

particularity herein is that the fisherman is sitting in the belly boat. In this case, s/he is sitting in a special seat, respectively holding device, in which her/his legs are hanging in the water. Forceful paddling moves with the legs will move the boat over the water surface and thereby it will be simultaneously steered into the desired direction. As paddling in rubber boots under water is not easily done, the fisherman will have to don corresponding flippers on top of the rubber boots. Moreover, the paddling movements are tiring and, on account of the sole employment of said option of locomotion, the use of the floatable device is limited due to weather conditions and strong currents.

The object of the invention is to provide a simple drive for a floatable device, which may also be employed for sport fishing. Such a drive should be quickly and easily mountable and again dismountable, and be usable at the most various swimming devices.

On account of the employment of an electro-mechanical drive, which is located completely underneath the surface of the water, the surface of the water is only insignificantly moved by the propeller motion when the floatable device advances, and does not generate any mentionable wave formation, respectively generation of noise, which would result in the fish swimming away from said grounds. Furthermore, such an electro-mechanical drive allows for a quicker and simpler accessibility of remotely located fishing

grounds.

Such an electro-mechanical drive, which may be employed for a floatable device, preferably for a belly boat, according to the invention allows for being connected to and via a mount, which is located underneath the water line of the floatable device, and if needed to be released again therefrom. Such a connection may be also referred to as a quick coupling, wherein the mount with the floatable device is for example attached by means of an adhesive bond or equivalent connections. Preferably, such a mount may include a T-shaped incision, which, after mounting, is filled by a foot with a straight contact area of the electro-mechanical drive device. In order to prevent the drive from loosening during operation or else from going missing, the drive may be secured by suitable means.

Essentially, the proper drive consists of a motor, which optionally may be equipped with a transmission as well. A drive propeller, which, while being attached, is located outside a watertight casing, is directly or via a transmission axis attached on a drive axis of the motor.

For fluidic reasons, the drive propeller is surrounded at a distance and in a ring-shaped manner by a protective device. Essentially, such a protective device covers the area of action of the drive propeller at a distance from the latter. The purpose of the protective device is that for example objects or branches or other garbage in the water will neither

be able to block nor to destroy the drive propeller. For example, the protective device may be affixed to the casing of the drive device via attachments, preferably exchangeably.

In a further preferred embodiment, it is possible for the protective device to not completely extend at a distance around the drive propeller, but only partially in a lower area, this means being provided on the side opposite the attachment of the drive. Thereby, undercurrent resistances are reduced, which may result in reducing the travel velocity.

The electro-mechanical drive is driven by means of an energy storage device, for example in the shape of a lithium-ion accumulator. Said energy storage device is located above the waterline and is connected by a cable connection to the drive, which is provided underneath the waterline. The power supply from the accumulator to the drive device is controlled by a wireless and watertight manipulation element of the person using the latter. For this purpose, the manipulation element, which is preferably formed as a remote control, includes a transceiver device. For the purpose of the motor control, said transceiver device cooperates with an open-loop or closed-loop control for the motor within one common box, in which the accumulator may be disposed. Said remote control may be attached to the body or else also to the floatable device. In addition to buttons for activating the drive motor, the remote control may

include displays as well, which for example may indicate the charge status of the energy storage device and/or also the current rotational speed of the drive. Should it become apparent that the charge capacity of the energy storage device would only be able to deliver current to the motor for a limited time, automatically the open-loop/closed-loop control would realize a reduction in the rotational speed of the motor. Practically, this means that an emergency operation is possible at any time, if for example the capacity of the energy storage device has only 20 % left. This safety feature ensures that the individual in the floatable device may safely reach the shore.

In case the individual moving with the floatable device would fall out of the floatable device, a mechanical connection is provided to the open-loop/closed-loop control, which effects an automatic stop of the drive. Thereby, it is simultaneously achieved that the individual will not move to far away from the floatable device, for example in case of an accident or on account of a large fish.

In a preferred embodiment, the open-loop/closed-loop control used for operating the motor consists of a pulse width modulation. In such a control type, for example at a constant frequency, the pulse duty factor of a rectangular pulse is modulated. When employing such an open-loop/closed-loop control, the motor does not require a transmission, which represents a weight reduction of the drive and reduces the

manufacturing cost.

In order to avoid overheating of the direct current motor provided within the drive, the casing of the drive may be provided with lateral intake openings for allowing the water to enter and to circulate around the drive. In this case, the casing is embodied double-walled in this area in order to avoid damages to the motor by means of the water. So that the entering water is able to leave the casing again, corresponding exit openings are provided. Such a configured motor cooling addresses any circumstances in any shape. This means that during faster travelling and the greater heating of the motor associated therewith also more cooling water may circulate around the motor.

A drive of the above-described type makes the use of floatable devices safer, optimizes the possible applications and limits the influence of meteorological conditions such as wind and currents. Thereby, the number of days of use increases by an average of 800 % per year, during which floatable devices may be used.

Further advantages, features and application options of the present invention will result from the following description in conjunction with the exemplary embodiments illustrated in the drawings.

The terminology and associated reference numerals itemized below in the list of reference numerals will be

employed throughout the description, the claims and the drawings. In the drawing, represents:

Figure 1 a perspective illustration of an electro-mechanical drive;

Figure 2 the same as Figure 1, however, in a rear-sided view;

Figure 3 the electro-mechanical drive in a rear-sided view;

Figure 4 the same as Figure 3, however in a frontal view;

Figure 5 the drive in a lateral view;

Figure 6 the drive in a lateral sectional illustration;

Figure 7 a potential mount, which is located at the floatable device;

Figure 8 an embodiment of the drive in a lateral view;

Figure 9 the same as Figure 8, however in a plan view;

Figure 10 the same as Figure 8, however in a frontal view without the drive propeller;

Figure 11 the same as Figure 10, however, in a rear-sided view.

Figure 1 represents a perspective view of a drive 1. Said drive 1 includes a mounting foot 2, from which a mount 10

extends in a streamlined formation, which ends in a casing 3. Above the casing 3 is illustrated a connecting support 6, which, via a connecting part 8, is connected to a ring-shaped formed protective device 5. In addition to the connecting support 6 protruding from the mount 10 is formed another connecting support 9. At the end sides, the connecting supports 6, 9 are respectively provided with connecting parts 8. It is via said connecting parts 8 that the ring-shaped protective device 5 is attached at two points. In this case, the protective device 5 essentially covers the circumferential space of a drive propeller 7 at a distance therefrom.

The examples illustrated in the Figures 1 to 2 are illustrated rotated by 180° compared to their normal operating position.

The casing 3, which represents the housing around a motor 17, has a streamlined formation and, at the tip 28 thereof, is formed flow-optimized in such a manner that considerable current resistances will not occur during operation. The mount 10, which is likewise formed in a flow-optimized manner, ends in a mounting foot 2, which will be addressed in more detail later.

The perspective rear-sided view of the drive 1 in Figure 2 clarifies one more time the attachment of the protective device 5 via the connecting supports 6 and 9. In this case, both the connecting supports 6 and 9 and the mount 10 are formed in such a flow-optimized manner that they will have the least possible resistance in the medium water. A power

supply connection 4 is illustrated at the front end of the mount 10. Figure 3 clarifies the flow-optimized formation of the drive 1 with the connecting supports 6 and 9 and the mount 10 and the tip 28 one more time. Said illustration reveals very well a contact area 23 of the mounting foot 2.

Figure 4 reveals that the drive propeller 7 is formed at a circumferential distance to the protective device 5. This circumstance produces a very good thrust force of the drive 1. Also the side lines 11 contribute to said purpose, which extend from a front 11 to the frontal part according to Figure 5.

Figure 6 represents a section A - A according to Figure 3. In this case, starting at the power supply connection 4, a channel 13 is located in the mount 10, which channel ends for example at a plug-in device 16. The channel 13 protects a cable connection to the motor 17 from entering water. In said illustration the motor 17 is disposed within the casing 3, preferably in the frontal part of the drive 1. In this embodiment, a transmission 22 is illustrated following the motor 17. Using a transmission 22 is not necessarily required, if the formation of the motor 17 corresponds to the application requirements of the drive 1. The output of the transmission 22 is connected to the drive propeller 7. In order to prevent the drive motor 17 from turning about the axis thereof, a rotation protection 15 is illustrated within the connecting support 6. Such a formation allows for the motor

17 to remain in the position thereof, and to fully transfer the drive force thereof onto the drive propeller 7; the rotation protection 15 likewise makes an installation into the casing 3 easier. Furthermore, Figure 6 reveals that via connections 18, the ring-shaped protective device 5 is releasably connected to the connecting support 6 as well as to the connecting support 9.

Figure 7 represents a mount 19, which, in the state of use, is firmly affixed underneath the floatable device. The mount 19 contains a T-shaped reception 20, into which the mounting foot 2, which has a complementary shape, may be pushed-in for example from one side. In a correct position between the mount 19 and the drive 1, via a depression 21 in conjunction with a break-through 14, an insertable securing element may secure the position between the drive 1 and the mount 19. After having used the drive 1, simply removing the securing element from the mount 19 and the break-through 14 is possible, such that subsequently, the drive 1 may be removed from the mount 19. The mount 19 allows for employing the same drive 1 also for several different floatable devices.

Compared to the example in the Figures 1 to 7, a modified embodiment of a drive 26 is represented in the Figures 8 to 11.

As revealed in Figure 8, a protective device 24 is provided at the drive 26, which unlike the protective device 5, does

not have a circular formation. Starting at the casing 3, connecting supports 25 are provided in a slanted position, over which, from the end sides spans the protective device 24 in the shape of a segment of a circle or of an arc. Such a construction type essentially reduces the flow resistance of the drive device 26 altogether, and nevertheless achieves sufficient protection for the drive propeller 7, which is not illustrated in this exemplary embodiment. This measure is achieved in that the protective device 24 only protects the lower part of the drive propeller 7, which is particularly at risk of being damaged by objects floating in the water. The embodiment of the connecting supports 25, which, starting at the casing 3, extend in a streamlined manner to the rear, likewise reduce the flow resistance. At the end sides, at both ends of the protective device 24, sections 32 are formed in a rounded manner, which may be in particular seen in Figure 9. In a preferred embodiment, said sections may be formed to project outwards from the segment of a circle or of an arc. Such an embodiment may be seen in the Figures 10 and 11.

Unlike the example illustrated in the Figures 1 to 7, laterally at the casing said embodiment of the drive 26 includes intake openings 27 for the water surrounding the drive 26. Thus, the water may penetrate through said intake openings 27 into a partial area of the casing 3, in order to thereby achieve cooling of the motor 17. In the area of the intake openings 27, and the thereto connected, however not illustrated, interior cooling channels, preferably the encasing

3 may be formed double-walled. So that the cooling medium is able to exit the casing 3 again, exit openings 30 are for example located at the end sides in the connecting supports 25. This arrangement is illustrated in Figure 10, which likewise exactly reveals the segmented formation of the protective device 24. The non-illustrated drive propeller 7 is attached to a drive shaft 31. By means of a propeller connection 29, the drive shaft 31 is sealed with regard to the casing 3.

In a frontal view, Figure 11 one more time represents the flow-optimized configuration of the drive 26 in said embodiment.

List of reference numerals

1	drive
2	mounting foot
3	casing
4	power supply connection
5	protective device
6	connecting support
7	drive propeller
8	connecting piece
9	connecting piece
10	mount
11	side line
12	front
13	channel
14	break-through
15	rotation protection
16	plug-in device
17	motor
18	connection
19	mount
20	reception
21	depression
22	transmission
23	contact area
24	protective device
25	connecting supports
26	drive

27 intake opening

28 tip

29 propeller connection

30 exit opening

31 drive shaft

32 section

PATENTKRAV

1. Elektromekanisk drev (1, 26) til en indretning med flydeevne, som kan anvendes til sportsfiskeri, omfattende en elektrisk kabelforbindelse, en vandtæt beklædning (3), en drivskrue (7), en smal holder (10), en fastgørelsesfod (2), en beskyttelsesindretning (5, 24) og en motor (17), hvor drevet (1, 26) er forbundet med et energilager via den elektriske kabelforbindelse, og dettes motor (17) via dettes drivaksel (31) er forbundet med den uden for den vandtætte beklædning (3) anbragte drivskrue (7), og den smalle holder (10) på en side er forbundet med beklædningen (3), hvor en fri ende af holderen (10) løber ud i fastgørelsesfoden (2) til forbindelse med en på indretningen med flydeevne anbragt holder (19), og beskyttelsesindretningen (5, 24), som ringformet eller med et cirkel- eller bueafsnit i en afstand omgiver drivskruen (7), endvidere findes udgående fra beklædningen (3), den vandtætte beklædning (3) har to udragende, med afstand liggende forbindelsesstøtter (25), hvis ender overspændes af beskyttelsesindretningen (24), **kendetegnet ved, at** den vandtætte beklædning (3) i området af motoren (17) er udført i det mindste dobbeltvægget og på sin yderhud er gennembrudt med indløbsåbninger (27) til indstrømning af kølevand, som kan strømme ud igen i området af forbindelsesstøtterne (25) via udløbsåbninger (30), og at den elektriske kabelforbindelse på den ene side via en strømforsyningstilslutning (4) gennem en kanal (13) inde i holderen (10) er ført ud til motoren (17) og på stikbar måde er forbundet med energilageret.

2. Drev ifølge krav 1, **kendetegnet ved, at** holderen (19) har en optageenhed (20), som omfatter en komplementær udformning af fastgørelsesfoden (2), og at fastgørelsesfoden (2) eller holderen (10) til sikring af det indsatte drev (1, 26) i holderen (19) omfatter en gennembrydning (14), som korresponderer med en fordybning (21) i holderen (19), via hvilken drevet (1, 26) kan fikseres i holderen (19) med en indsættelig sikring.

3. Drev ifølge kravene 1 eller 2, **kendetegnet ved, at** fastgørelsesfoden (2) omfatter en lige kontaktflade (23).

4. Drev ifølge krav 1, **kendetegnet ved, at** der til fastgørelse af beskyttelsesindretningen (5) fra holderen (10) og beklædningen (3) udgår forbindelsesstykker (6, 9), som via forbindelser (18) er fastgjort med forbindelsesstykkerne (6, 9).

5. Drev ifølge krav 1, **kendetegnet ved, at** beskyttelsesindretningens (24) ender hver især omfatter afsnit (32), som rager udad vendt bort i forhold til beskyttelsesindretningen (24).

6. Drev ifølge et eller flere af de foregående krav, **kendetegnet ved, at** beklædningen (3) med holderen (10) og beskyttelsesindretningen (5, 24) består af kunststof.

7. Drev ifølge krav 1, **kendetegnet ved, at** energilageret er udformet som akkumulator, fortrinsvis som lithium-ion-akkumulator, og er an-

bragt inde i en vandtæt boks med en styring/regulering samt en sender-/modtagerenhed.

8. Drev ifølge krav 1, **kendetegnet ved, at** styringen/reguleringen af motoren (17) i forbindelse med sender-/modtagerenheden kan betjenes med en fjernbetjening, hvor fjernbetjeningen ud over taster til ændring af motoromdrejningstallet omfatter displayelementer til motoromdrejningstal og energilagerets opladningstilstand.

9. Drev ifølge kravene 7 og 8, **kendetegnet ved, at** styringen/reguleringen automatisk kan omskiftes ved en reduceret opladningstilstand for energilageret til en strømforsyning af drevet (1, 26), som kan føre til en lavere transporthastighed.

10. Drev ifølge et af de foregående krav, **kendetegnet ved, at** indretningen med flydeevne er udformet som belly boat.

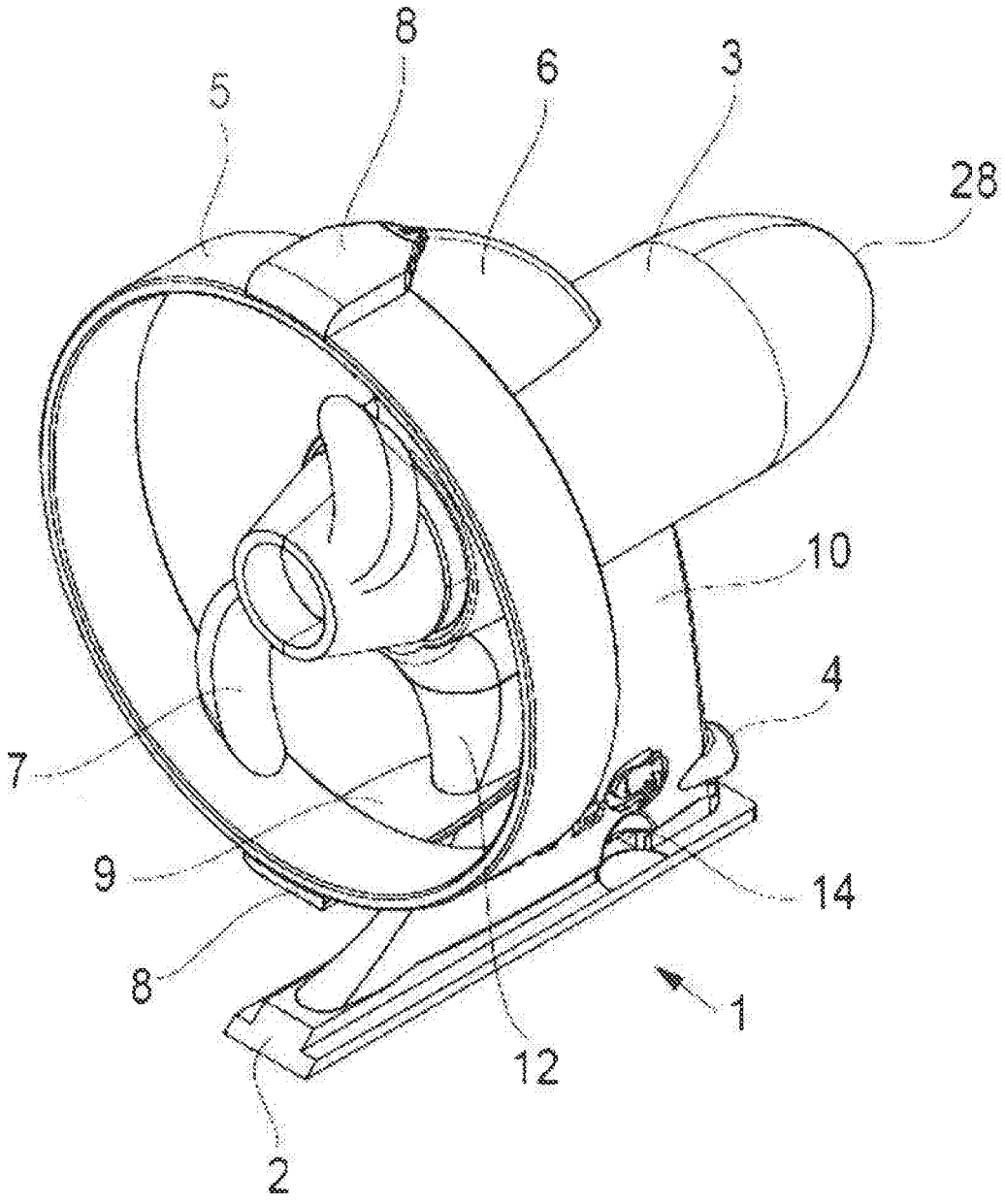

Fig. 1

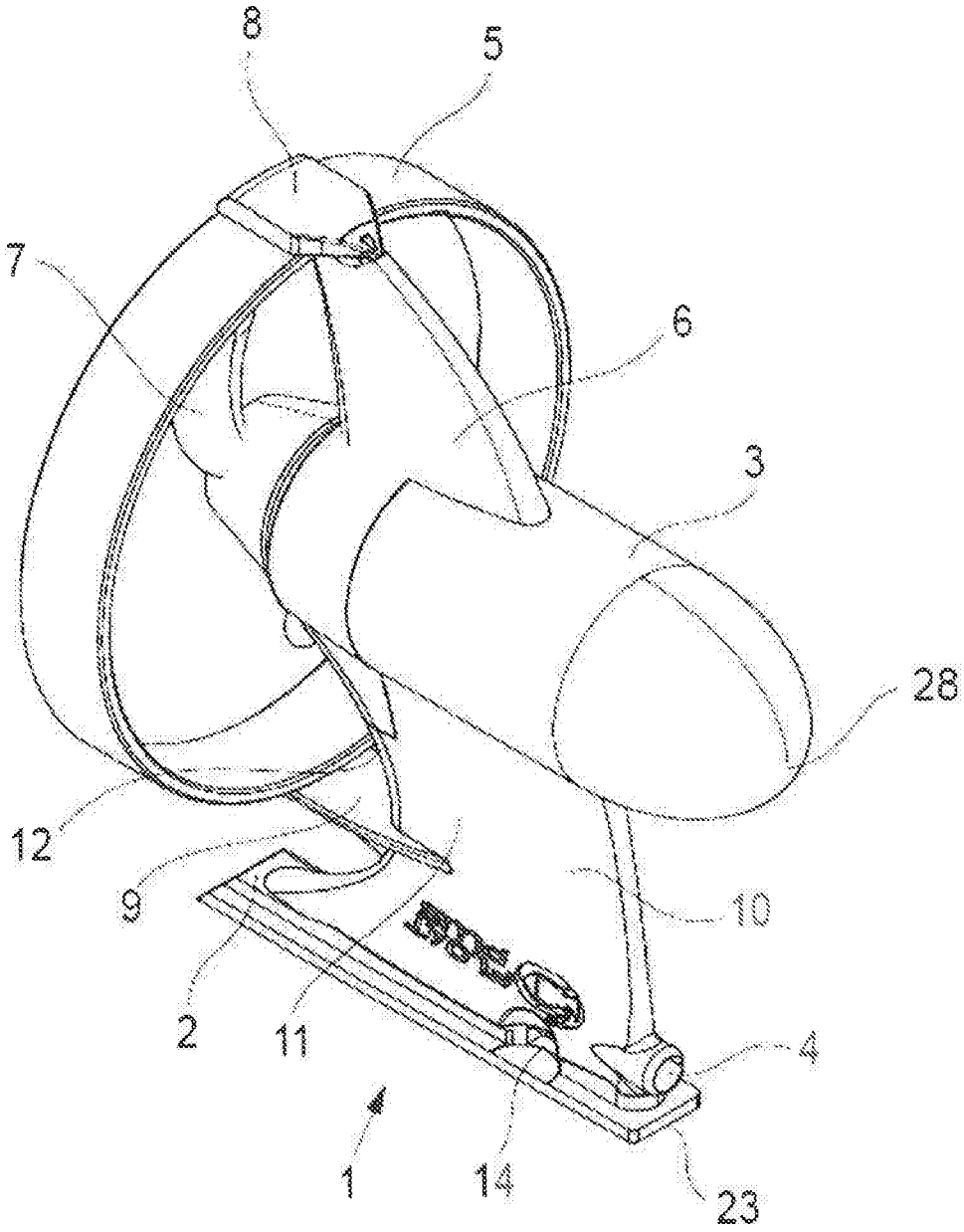

Fig. 2

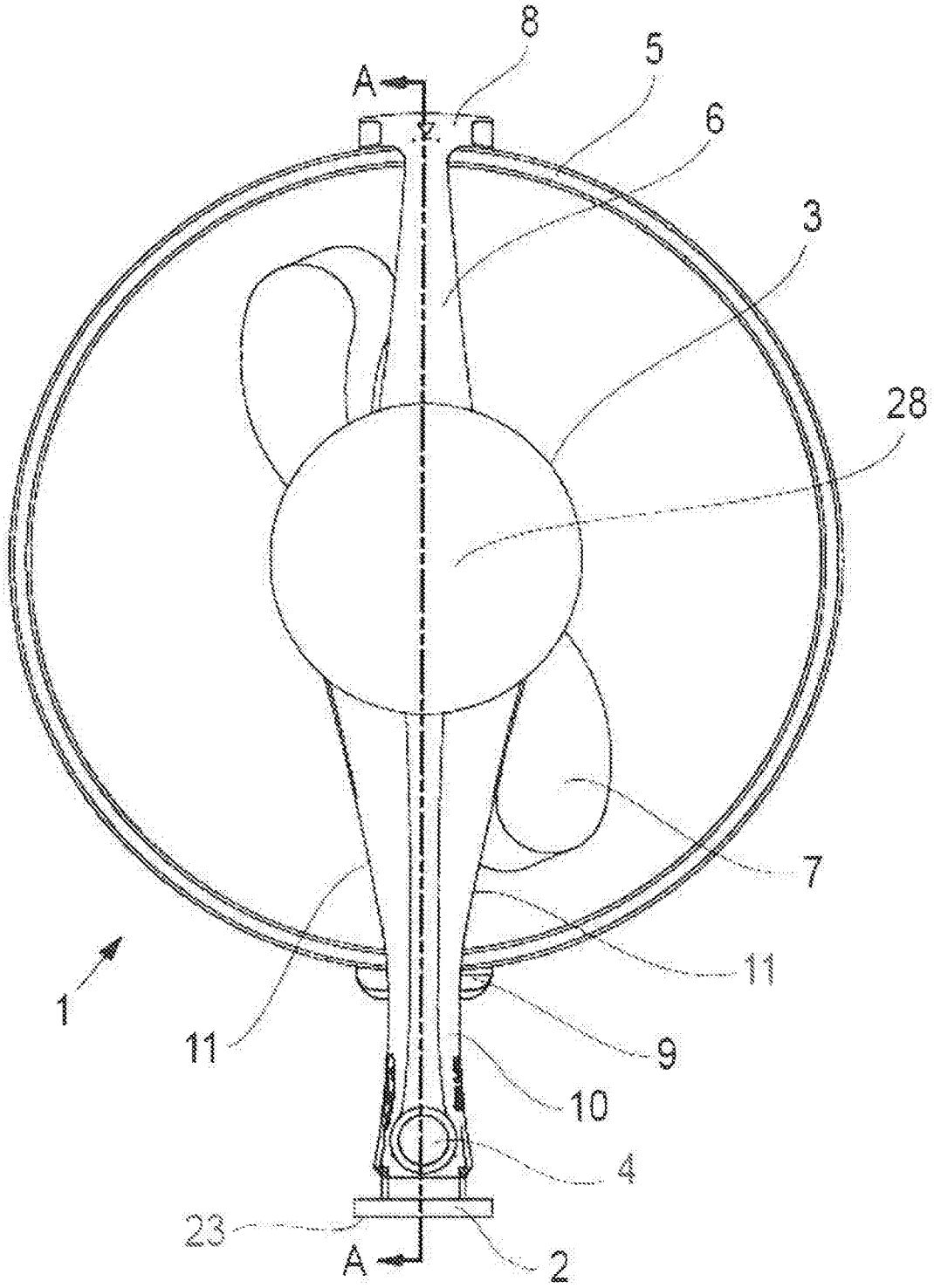

Fig. 3

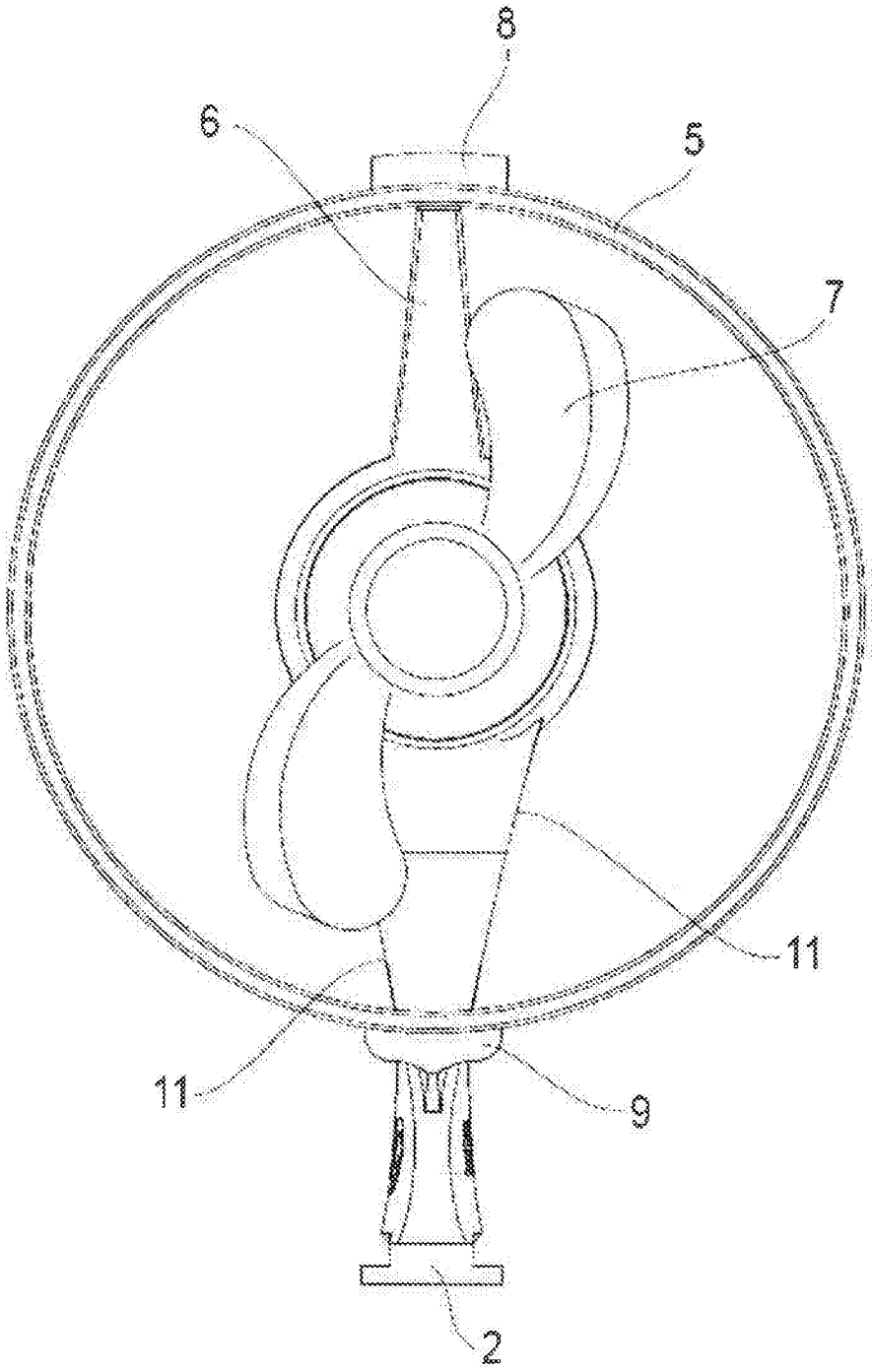

Fig. 4

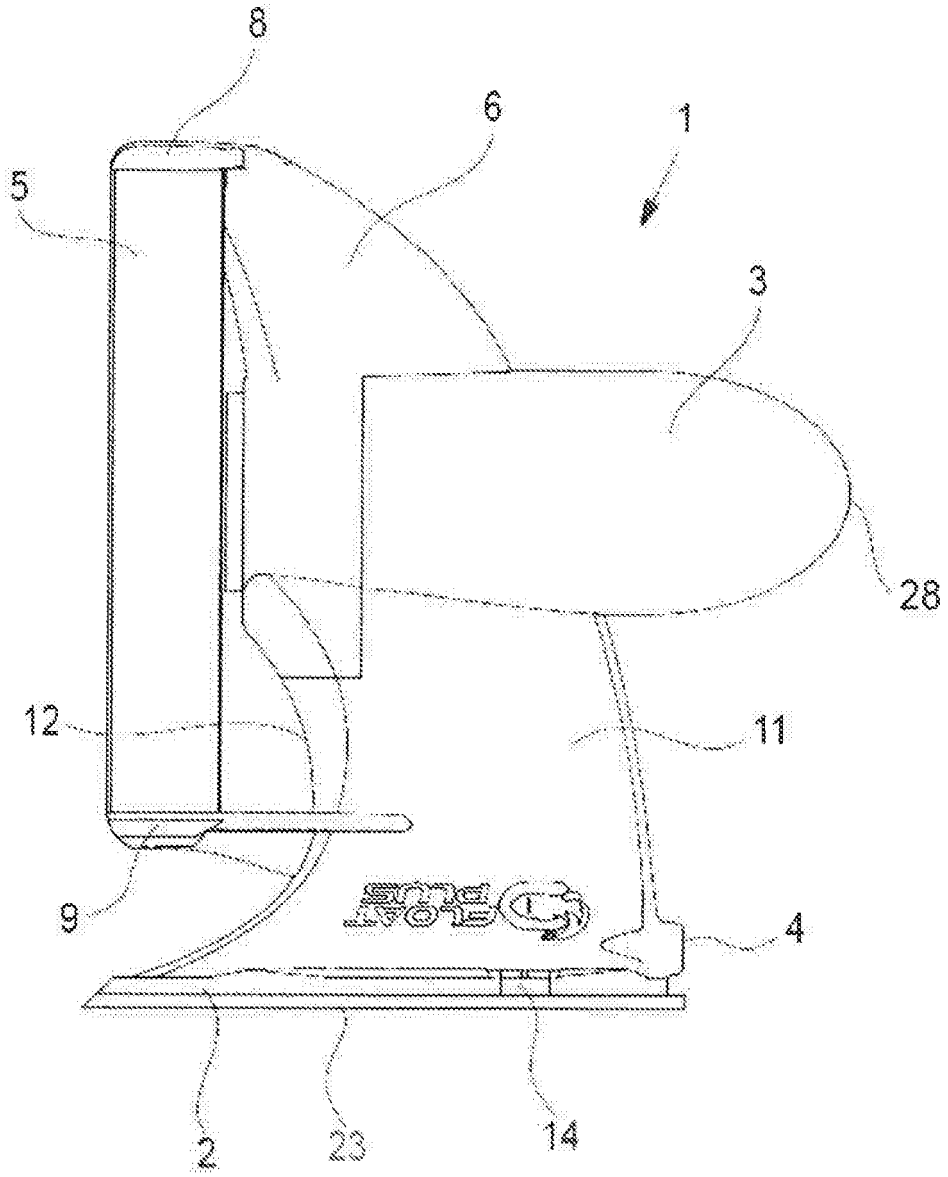

Fig. 5

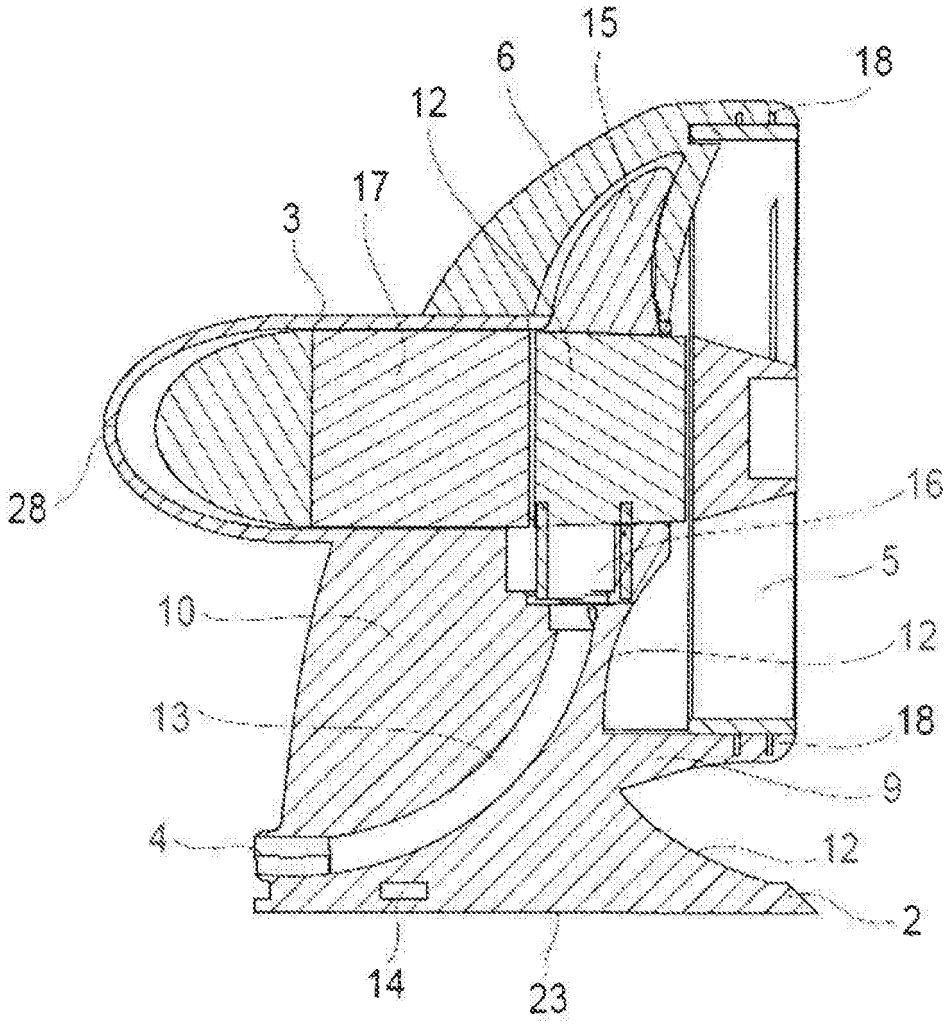

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Fig. 6

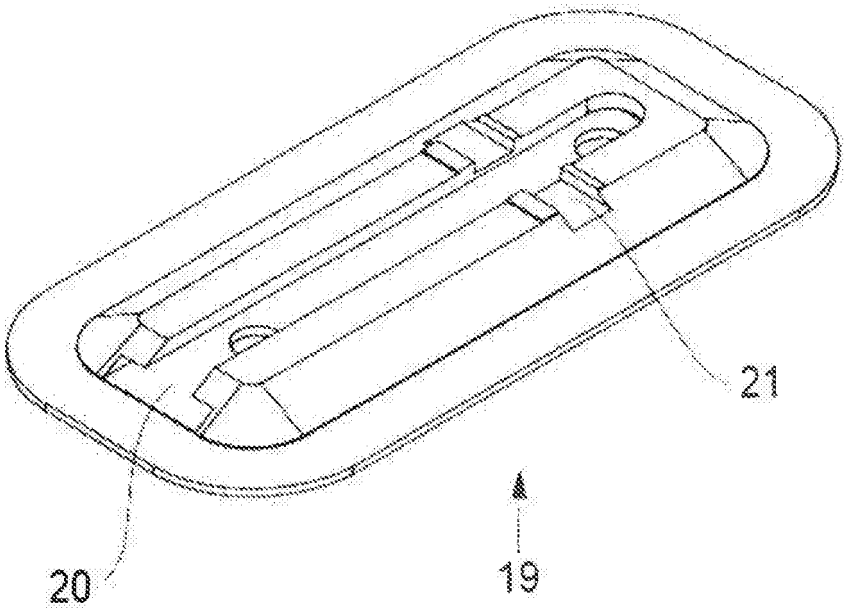

Fig. 7

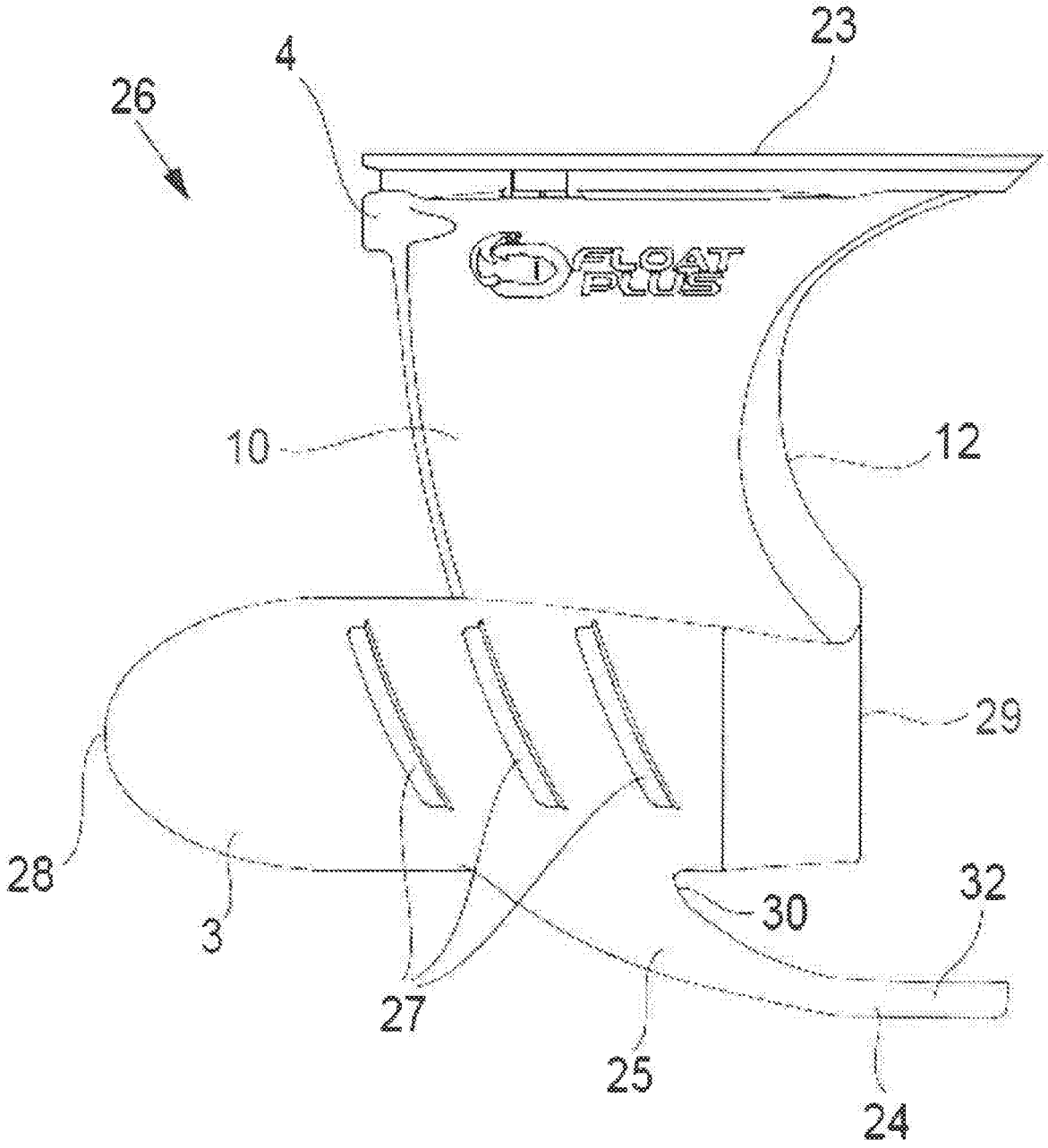

Fig. 8

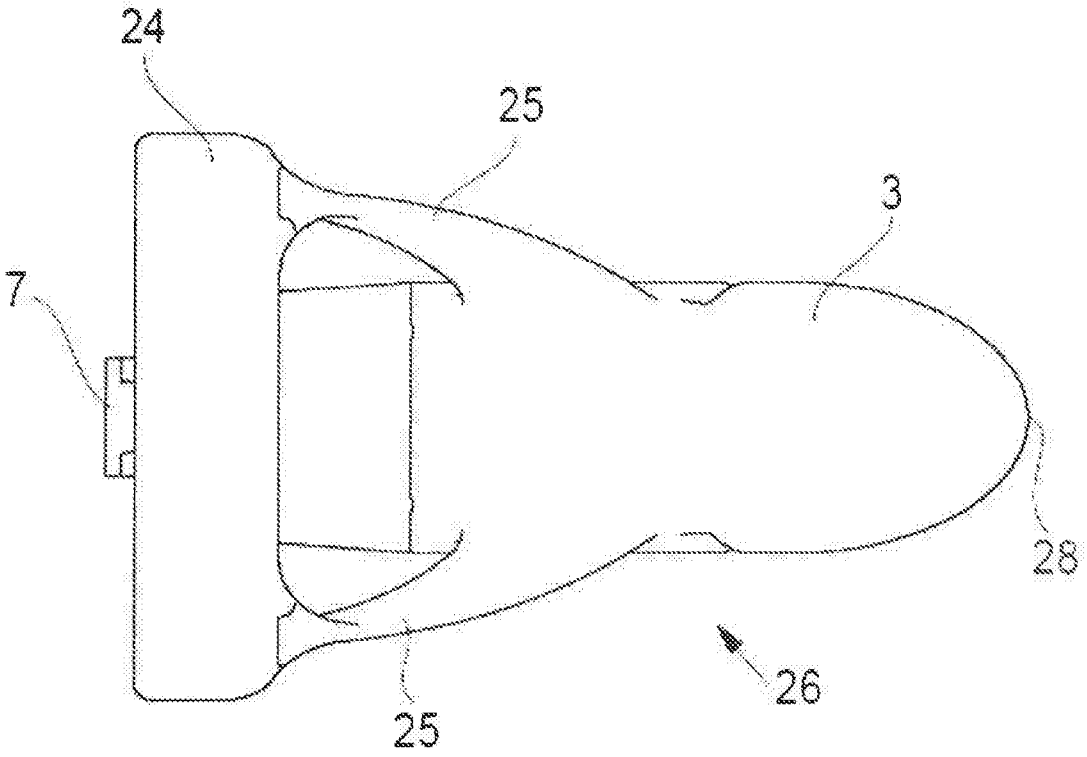

Fig. 9

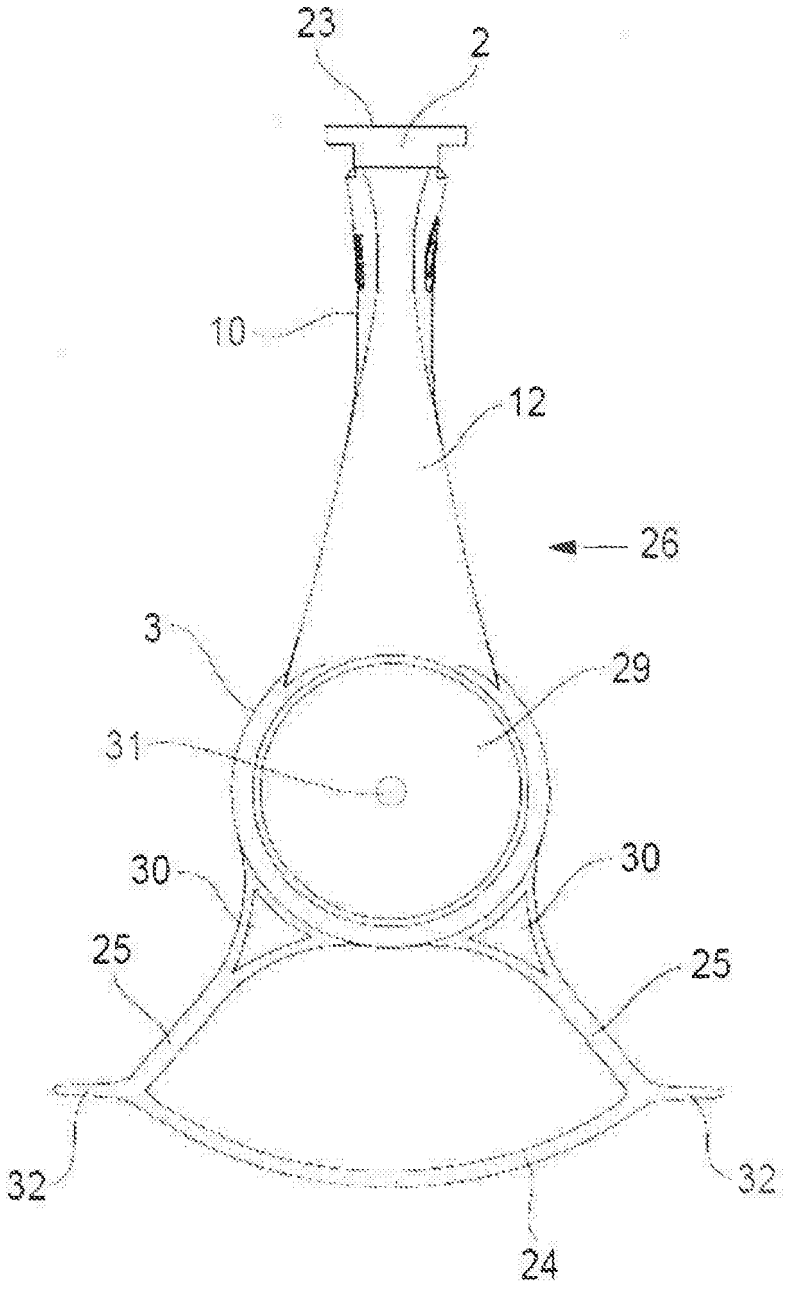

Fig. 10

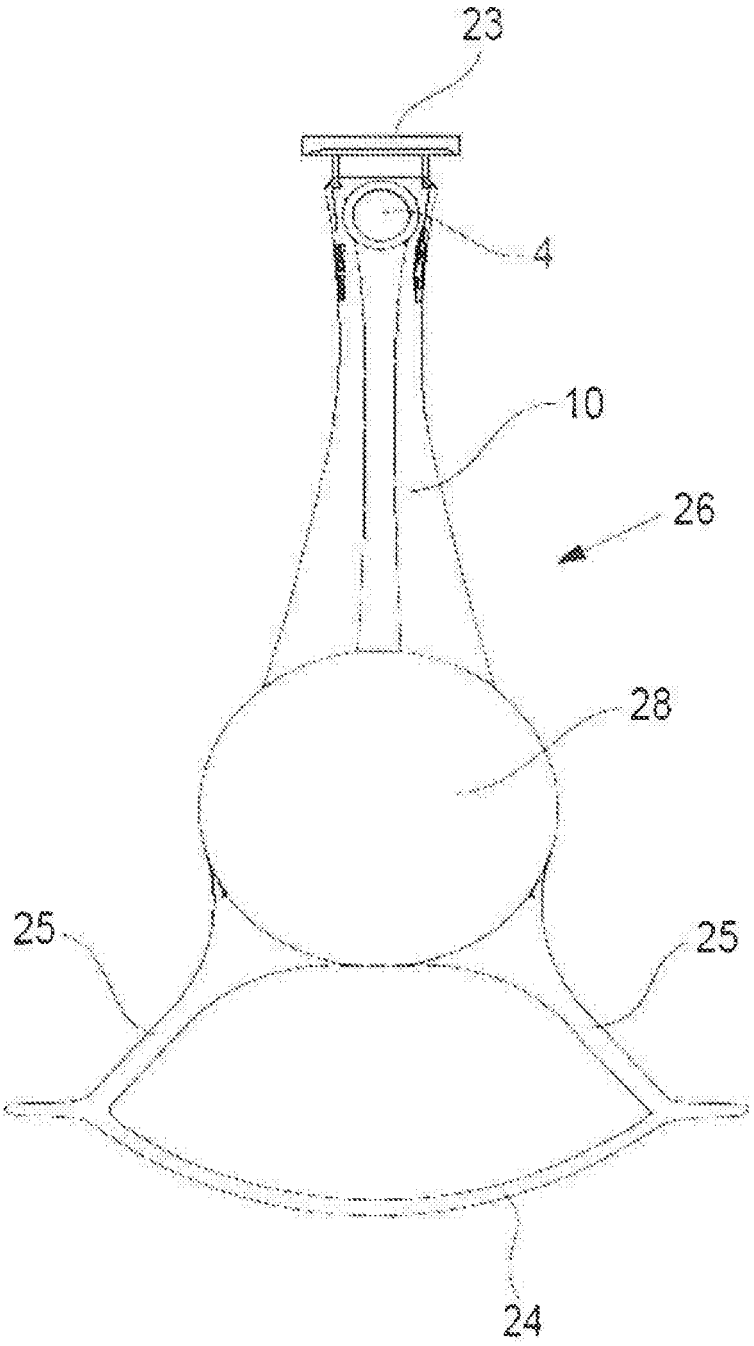

Fig. 11